

A Specimen of the Deep-sea Anglerfish *Cryptopsaras couesi* Gill (Teleostei, Lophiiformes, Ceratiidae) Caught on the Eastern Flank of the Rockall Trough, with Comments on the Distribution of the Species in the North-eastern Atlantic.

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This paper reports the capture of an adult female *Cryptopsaras couesi* Gill, 1883 (Fig. 1a) by the vessel 'Oruna' whilst fishing for mixed white fish at approximately 55°30'N 09°35'W, about 120 kilometres west of Bloody Foreland, Co. Donegal. The fish, 247mm standard length, SL, (measurement taken after fixation in 10% formalin and transfer to 70% industrial methylated spirit for long-term storage), was caught on 20 April 1994 in a rock-hopper trawl (a light white-fish bottom-trawl adapted for use over rough ground) fished at a depth of approximately 150-200 fathoms (275-366m). The specimen, which apart from a large tear in the body wall on the left flank, is in good condition, is deposited in Glasgow Museums as Z.1994.98. (Any correspondence regarding it should be addressed to the second author).

General Biology of Ceratioids

Adult ceratioids are mesopelagic and bathypelagic fish. As they metamorphose from their epipelagic larval stage and descend into the depths these anglerfish develop a striking sexual dimorphism. Females

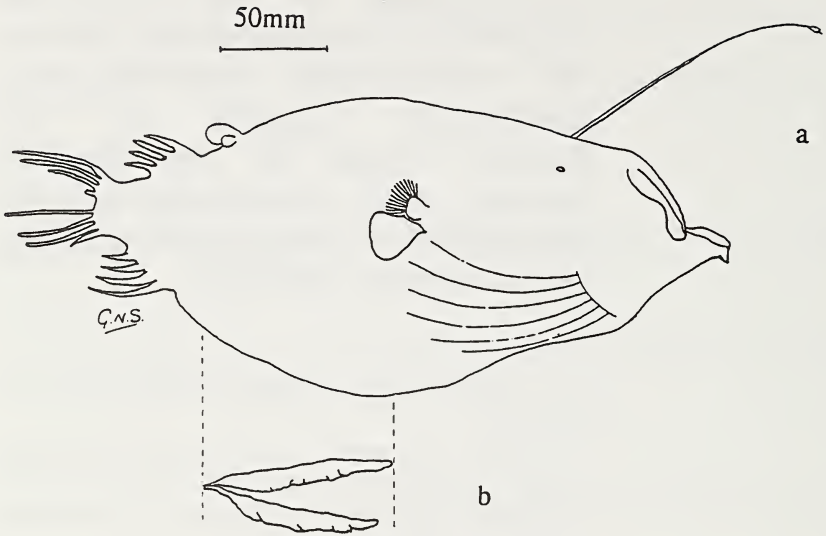


Figure 1: a) Free-hand sketch of *Cryptopsaras couesi* (Glasgow Museums Z.1994.98) and b) its ovaries.

are readily identified by the presence, in most species, of a modified anterior dorsal fin ray, the illicium, which bears a bulb-shaped light organ at its tip. This is thought to act as a lure attracting prey towards the cavernous mouth, hence the common-name of 'anglerfish'. They are believed to grow slowly and to live for several years. By contrast ceratioid males are dwarf, in most species growing to less than 10% of the length of the female, and are believed, at least in some species, to be subannual (Marshall, 1979). They lack the 'angling' apparatus of the females and in many species their jaws are used not for feeding but for attachment to metamorphosed females, i.e. they are so-called 'parasitic' males (Regan, 1925; Bertelsen, 1951; Pietsch, 1976). The larvae, unattached males and even the adult females of most species are small and are caught usually only by nets designed or adapted for research purposes. Adults of the large species which comprise the family Ceratiidae are occasionally caught during commercial fishing but, since these fish normally inhabit the deep ocean, they are generally inaccessible to fisheries.

General Biology of *Cryptopsaras couesi*

C. couesi is the only species recognised within its genus. Females are readily distinguished from all other ceratioids by the presence of three bulbous swellings or caruncles, actually modified fin rays containing bioluminescent tissue, in advance of the second dorsal fin. The largest caruncle is in the midline and it is flanked on either side by a smaller one (Pietsch, 1986).

C. couesi is the second largest species of ceratioid. Females may reach 450mm SL. (Quéro & Vayne (1989) list a specimen 820mm total length, TL, but this would seem to be an error). It is one of the most commonly caught ceratioids. Pietsch (1986) notes 378 adolescent and adult females in collections worldwide, mostly caught between 500 and 1000m. In the Atlantic it has been recorded from approximately 35°S to approximately 65°N, (Pietsch, 1986; Quéro & Vayne, 1989; Du Buit et al., 1989), although larvae and unattached males seem to have a more restricted distribution occurring only in lower latitudes, between 35°S and 40°N (Bertelsen, 1951). Quéro & Vayne (1989) list a total of 56 records of *C. couesi* from the north-eastern Atlantic and Nigel Merrett (pers. comm.) informs us that small specimens are not uncommon in midwater trawl catches. Most records of large females, defined by Quéro & Vayne (1989) as >120mm SL, are from around Iceland. Their data suggest that they are present in these high latitudes throughout the year. Reports of large females south of Iceland are rare and they list only four from south of 63°N. Since their paper three further specimens have been reported:

1). 60°05'N 07°20'W, 500m, 15 April 1989, 195mm SL., BMNH 1994.10.31:1 (Minchin & Isaev, 1989).

2). 30 miles west of Eshaness, Shetland [approx. 60° 30'N 02°N 30'W], approx. 150 fathoms [275m], 15 May 1994, 212mm SL. BMNH 1994.9.28:5 (Blackadder, 1994a & b).

3). Rockall Bank, >200m, June 1994, 218mm SL. Collections of Department of the Marine, Fisheries Research Centre, Dublin (Ciaran Kelly, pers. comm.).

Many of the records listed by Quéro & Vayne (1989) quote only TL. The relationship between TL and SL for *C. couesi* is expressed in Fig. 2 and, although based on a small amount of data, this regression equation has been used to estimate SL so as to make data from different sources comparable.

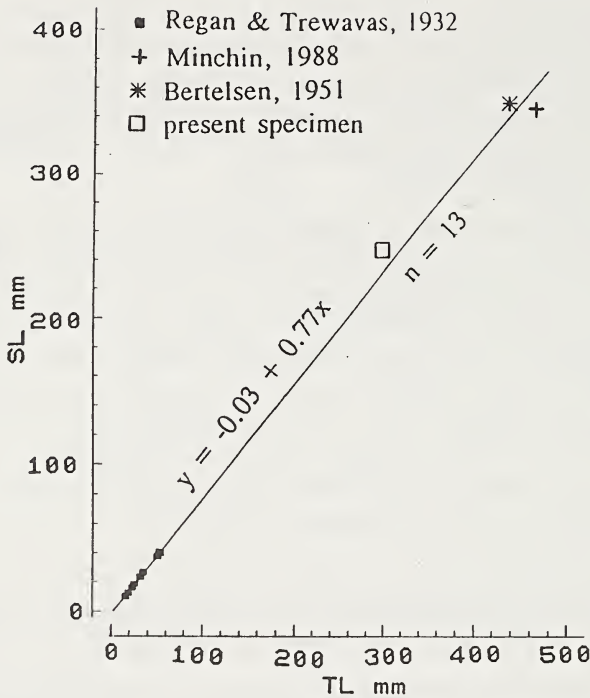


Figure 2: Total length (TL) plotted against standard length (SL) for *Cryptopsaras couesi*. Data are from Regan & Trewavas (1932), Minchin (1988), Bertelsen (1951) and the present specimen.

The north-eastern Atlantic distribution of *C. couesi* in relation to length is shown in Fig. 3.

For ceratioids generally, it has been assumed that the area where larvae and unattached males occur represents the breeding area of the species (eg. Bertelsen, 1951). Quéro & Vayne (1989) suggest that the apparent concentration of large female *C. couesi* off Iceland and their absence from within the breeding zone reflects merely differences in sampling effort and the kind of gear used in these two areas. Large females collected far outside the presumed breeding area are thought to be individuals which are lost to the breeding population, having drifted out of the area in surface or intermediate currents during their epipe-

logic larval, metamorphosis or early adult stages. *C. couesi* may be more susceptible than other anglerfish to being carried in surface currents as there is evidence in the literature that this species spends a longer part of its early life at shallower depths than do other ceratioids. Regan & Trewavas (1932) specifically comment on the presence of small females relatively near the surface while Bertelsen (1951) reports that about 60% of young female *C. couesi* captured by the Danish 'Dana' Expedition were caught at depths of less than 1000m, compared with only 13% of other ceratioids. In the surface and intermediate waters of much of the subtropical and temperate North Atlantic major currents flow in a north-easterly direction.

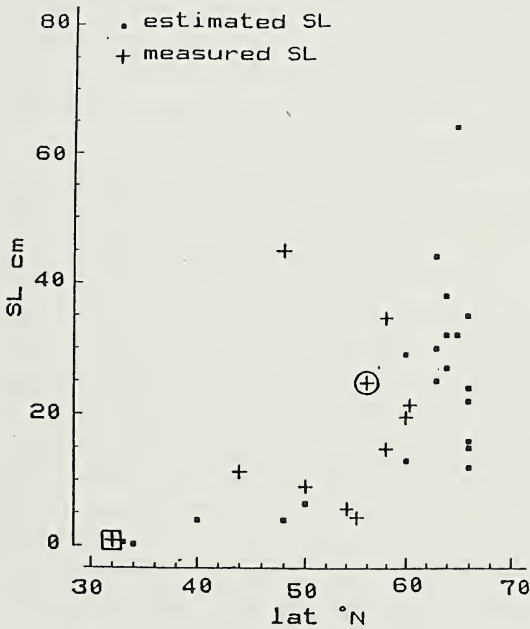


Figure 3: Plot of latitude °N against fish length for female *Cryptopsaras couesi*. Data are from Quérou & Vayne (1989), Minchin & Isaev (1989), and Blackadder (1994a). Lengths recorded as TL have been converted to estimates of SL using the relationship expressed in Fig.2. Estimated SL values are indicated by squares to distinguish them from measured SL values which are indicated by crosses. The data point for the present specimen is encircled. That for another previously unpublished specimen, from off Madeira, (Swinney, in prep.) is enclosed in a square.

Reproductive Status of the Specimen

Pietsch (1976) notes that female Ceratiidae which lack attached males never have well developed gonads. He suggests that, in this family, '...females probably never become gravid until stimulated by the permanent parasitic attachment of a male'. The present specimen carries neither attached males nor any apparent scars indicating the former presence of males which might have become detached. Yet, despite the lack of a male, its ovaries are moderately large (maximum dimensions of left ovary - length 85mm (34% SL), depth 10mm, thickness 7mm; Fig. 1b). They are paired sac-shaped structures each opening into the cloaca via an oviduct approximately 12mm in length.

Comparative data on the size of mature ovaries are lacking from the literature but the relative length of the ovary is similar to that reported by Bertelsen & Krefft (1988), i.e. 20-41% SL, for individuals of various species of *Himantolophis* which they considered to be approaching maturity. However, those of the present specimen are considerably smaller in both depth and thickness.

Ovarian eggs of mature or nearly mature ceratioids are reported to be small and slightly ovoid, measuring 0.5-0.8mm along their major axis (Bertelsen, 1980; 1984; Pietsch, 1984). Histological examination of a transverse section of the left ovary of the present specimen, taken about midway along its length, reveals that the ovarian cavity contains numerous lamellae in which oogenesis is taking place. The eggs are in clusters; each of which contains germ cells in various stages of maturation. The most mature oocytes (0.10-0.12mm diam.) are in the diplotene stage with several peripheral nucleoli. The acidophilic cytoplasm of these cells suggests that vitellogenesis has begun and this is supported by the presence of early yolk vesicle formation (Hibiya, 1982). Traces of a positive Periodic Acid-Schiff (PAS) reaction indicate that the chorion is beginning to form. Thus the present female appears to have been entering the final stages of oocyte maturation.

Acknowledgments

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